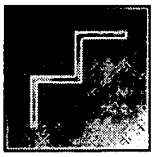

ARTICLES OF INTEREST: 1999

WIRELESS COMMUNICATIONS FOR THE TWENTY-FIRST CENTURY

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Over the past decade, the marketplace has been filled with a new generation of consumer products which implement highly advanced digital concepts. Until a decade ago, these concepts were primarily in the domain of research papers and graduate school textbooks, with application only to military and space programs at costs well beyond the level supportable by a consumer market. Consider three examples of telecommunication products which have become commonplace:

- wireline data modems capable of transmitting and receiving up to 56K bits/sec on dialed public-switched lines;
- digital television satellite receivers, which incorporate sophisticated video compression and modems receiving 30M bits/sec; and
- digital cellular telephones incorporating advanced voice compression and highly efficient mobile communication modems.

Each of these contains on the order of a million transistors and yet, for only a few hundred dollars, has been sold to millions, and even tens of millions, of consumers. It is well known that their very existence, not to mention their low cost, is a consequence of rapidly accelerating integration of electronic circuitry, which was so accurately predicted a generation ago by Moore's Law.

But there is a more subtle consequence of this exponential rise in device density and speed available on a silicon chip. It is the fact that only one chip, or at most a few chips, implement virtually the entire system, with only the additional requirements for a battery or power supply, a case, and display, keyboard and/or microphone and speaker, depending on the application. Even though the product is far more complex than the transistor radio, the electric clock, or the microwave oven of previous electronic generations, the design tasks and role of the end-product manufacturer is not significantly different from what it

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was before. All the complexity is in the **system on a chip**. Thus wireless communication devices are following the trend of what has already happened in the personal computer industry. This also enables the confluence of mobile voice communication with data access, processing and transmission, providing the nomadic consumer with all the capabilities currently available only on the fixed desktop. These multi-faceted developments will shape the future of the wireless industry well into the next century, realigning the roles of engineering, manufacturing, marketing and distribution.

Professional Biography of Andrew Viterbi

In July 1985, Dr. Andrew J. Viterbi co-founded QUALCOMM, Inc., a developer and manufacturer of mobile satellite communications and digital wireless telephony, where he currently serves as Vice Chairman. Under his leadership, QUALCOMM has received international recognition for innovative technology in the areas of digital wireless communication systems and products based on Code Division Multiple Access (CDMA) technologies. QUALCOMM now employs nearly 8,000 people in its San Diego, California headquarters and other offices around the world.

Prior to co-founding QUALCOMM, Dr. Viterbi co-founded LINKABIT Corporation in 1968, a digital communications company, where he served he served as Executive Vice President and later as President.

From 1963 to 1973, Dr. Viterbi served as a Professor at the University of California, Los Angeles (UCLA) School of Engineering and Applied Science, where he did fundamental work in digital communication theory and wrote numerous research papers and two books, for which he has received international recognition. He continued teaching on a part-time basis at the University of California, San Diego until 1994, where he is currently Professor Emeritus.

From 1957 to 1963, Dr. Viterbi was a member of the Communications Research Section of the California Institute of Technology Jet Propulsion Laboratory. While there, he was one of the first communication engineers to recognize the potential and propose digital transmission techniques for space and satellite telecommunication systems. Viterbi received his B.S. and M.S. degrees from the Massachusettes Institute of Technology in 1957, and a Ph.D. from the University of Southern California, 1962. He is a member of both the National Academy of Engineering and the National Academy of Sciences.

Dr. Viterbi has received numerous awards and recognition for his leadership and substantial contributions to communications industry over the years. He has received honorary doctorates from universities in Canada and Italy and has been otherwise honored in Japan, Germany and Italy as well as the United States. He is a Fellow of the IEEE, a Marconi Fellow and a Member of both the U.S. National Academy of Engineering and the U.S. National Academy of Sciences.

All four international standards for digital cellular telephony utilize the Viterbi Algorithm for interference suppression, as do most digital satellite communication systems, both for business applications and for direct satellite broadcast to the home.

He is currently a member of the U.S. President's Advisory Committee on Information Technology and the Next Generation Internet.

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